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Energetics of ion heating during magnetic reconnections in Reversed Field Pinch[1] GENNADY FIKSEL, UW Madison, A.F. ALMAGRI, S.C. PRAGER, J.S. SARFF, C.R. SOVINEC, UW-Madison — It has been pointed out [S. Gangadhara et. al., PoP 15, 056121, 2008] that the magnetic energy released during reconnection events in reversed field pinch plasma is directly related to the magnitude of ion heating. In deuterium plasmas about 20% of the released magnetic energy was deposited into the bulk ion thermal energy. We extend the measurements of ion heating to hydrogen and helium plasmas. The bulk ion temperature was measured with a Rutherford scattering diagnostic, and the deposited fraction of magnetic energy was found to vary as the square root of the ions mass. It depends weakly on the ion charge, plasma density, and the magnetic field. The mechanism by which the ions are heated is still not identified. We speculate that it may be stochastic in nature based on similar mass scaling in Fermi-like stochastic heating in capacitive discharges. Global ion heating arises only when both core and edge magnetic reconnection occur. During so-called "core reconnection only" events the core resonant magnetic modes reach a substantial amplitude but the edge resonant modes are absent. The released magnetic energy and, subsequently, the ion heating are very small. There are indications that during these events the core modes may have an ideal character, thus not resulting in the reconnection of the equilibrium magnetic field.

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